Remarks:

Applicants appreciatively acknowledge the Examiner's confirmation of receipt of Applicants' claim for priority and certified priority document under 35 U.S.C. § 119(a)-(d).

Reconsideration of the application, as amended herein, is respectfully requested.

Claims 1 - 11 are presently pending in the application. Claims 1, 7, 8 and 10 have been amended. Applicants gratefully acknowledge that claims 8 and 10 have been indicated as allowable, if the 35 U.S.C. § 112 rejection of those claims were overcome, claims 9 and 11 have been allowed and claims 2 - 6 have been indicated as being allowable if rewritten to include all the limitations of the claims from which those claims depend.

In items 2 and 3 of the above-identified Office Action, claims 1, 7, 8 and 10 were rejected as allegedly being indefinite under 35 U.S.C. § 112, second paragraph. More specifically, it was alleged in the Office Action that the term "reduced" in claims 1 and 7 is a relative term not defined by the claim. Claims 1 and 7 have been amended to even more clearly set forth what is meant by the term "reduced". As such, it has been made clear in those claims that the reduction is as compared to the rhythm raw-information before post processing.

In particular, it is the post processing operation that reduces the ambiguities in the rhythm raw information.

Additionally in item 3 of the Office Action, it was alleged that in claims 1, 7, 8 and 10, it was not understood what was meant by "integer fraction". Claims 1, 7, 8 and 10 have been amended to define an "integer fraction" as "the integer fraction being determined by dividing "1" by an integer". Examples of integer fractions are "1/2", "1/3", "1/4" . . . . . 1/N.

Further in item 3 of the Office Action, it was alleged that in claims 8 and 10, the term "forged" was not understood. Claims 8 and 10 have been amended to replace the term "forged" with the term "upset" Pursuant to the Examiner's question in item 3 regarding the term "forged", it is not the intention of the Applicants that the term "forged" be interpreted as "formed". Instead, **upsetting** or **forging** a signal means that the time-length of the signal is reduced, but that the signal is not changed. For example, when you look at a complete sine function extending over a certain period, this period corresponds to a certain frequency. When this sine function is **forged** or **upset**, the amplitude is not changed, but the time period over which the sine function extends, is reduced. Thus by **upsetting** a sine function by the integer fraction 1/2, one

obtains a sine function having half the period or double the frequency. This definition for **forged** is supported in paragraph [0067] of the instant application, wherein **forge** is given as "i.e. spread with a factor smaller 1".

Also in item 3, it was indicated that claims 9 and 11 use the phrase "integer factor", which was indicated as being "clearly interpreted".

It is accordingly believed that the specification and the claims meet the requirements of 35 U.S.C. § 112, second paragraph. Note that the amendments to the claims made herein are solely for the purpose of providing greater clarity. The claims have not been amended to overcome the references.

In item 5 of the Office Action, claims 1 and 7 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by an article to Scheirer ("**SCHEIRER**") "Pulse Tracking with a Pitch Tracker." 1997, MIT Media Laboratory.

Applicants respectfully traverse the above rejections.

More specifically, claim 1 recites, among other limitations:

> "**means for postprocessing the rhythm raw-information for the sub-band signal** determined by the autocorrelation function, **to obtain postprocessed**

rhythm raw-information for the sub-band signal," [emphasis added by Applicants]

Similarly, Applicants' independent claim 7 recites, among other limitations:

> "**postprocessing the rhythm raw-information for the sub-band signal** determined by the autocorrelation function, **to obtain postprocessed rhythm raw-information for the sub-band signal**," [emphasis added by Applicants]

As such, Applicants' independent claims 1 and 7 require, among other things, **post-processing of the rhythm raw-information for the sub-band signal**. The cited **SCHEIRER** reference neither teaches, nor suggests post-processing of the rhythm raw-information for the sub-band signal, as required by Applicants' claims 1 and 7. Rather, the operation of the **SCHEIRER** reference is described in the instant application paragraphs [0013] - [0020], which states:

> "The expert publication "Pulse Tracking with a Pitch Tracker" by Eric D. Scheirer, Proc. 1997 Workshop on Applications of Signal Processing to Audio and Acoustics, Mohonk, N.Y., October 1997 describes a comparison of the abovedescribed oscillator concept to an alternative concept, which is based on the use of autocorrelation functions for the extraction of the periodicity from an audio signal, i.e. the rhythm information of a signal. An algorithm for the modulation of the human pitch perception is used for beat tracking.
>
> The known algorithm is illustrated in FIG. 3 as a block diagram. The audio signal is fed into an analysis filterbank 302 via the audio input 300. The analysis filterbank generates a number n of channels, i.e. of individual sub-band signals, from the audio

input. Every sub-band signal contains a certain area of frequencies of the audio signal. The filters of the analysis filterbank are chosen such that they approximate the selection characteristic of the human inner ear. Such an analysis filterbank is also referred to as gamma tone filterbank.

The rhythm information of every sub-band is evaluated in means 304a to 304c. For every input signal, first, an envelope-like output signal is calculated (with regard to a so-called inner hair cell processing in the ear) and sub-sampled. From this result, an autocorrelation function (ACF) is calculated, to obtain the periodicity of the signal as a function of the lag.

At the output of means 304a to 304c, an autocorrelation function is present for every sub-band signal, which represents the rhythm information of every sub-band signal.

The individual autocorrelation functions of the sub-band signals will then be combined in means 306 by summation, to obtain a sum autocorrelation function (SACF), which reproduces the rhythm information of the signal at the audio input 300. This information can be output at a tempo output 308. High values in the sum autocorrelation show that a high periodicity of the note beginnings is present for a lag associated to a peak of the SACF. Thus, for example the highest value of the sum autocorrelation function is searched for within the musically useful lags.

Musically useful lags are, for example, the tempo range between 60 bpm and 200 bpm. Means 306 can further be disposed to transform a lag time into tempo information. Thus, a peak of a lag of one second corresponds, for example, a tempo of 60 beats per minute. Smaller lags indicate higher tempos, while higher lags indicate smaller tempos than 60 bpm.

This method has an advantage compared to the first mentioned method, since no oscillators have to be implemented with a high computing and storage effort. On the other hand, the concept is disadvantageous in that the quality of the results depends strongly on the type of the audio signal. If, for example, a dominant rhythm instrument can be heard from an audio signal, the concept described in FIG. 3 will work well. **If, however, the voice is dominant, which will**

> **provide no particularly clear rhythm information, the rhythm determination will be ambiguous.** However, a band could be present in the audio signal, which merely contains rhythm information, such as a higher frequency band, where, for example, a Hihat of drums is positioned, or a lower frequency band, where the large drum of the drums is positioned on the frequency scale. **Due to the combination of individual information, the fairly clear information of these particular sub-bands is superimposed and "diluted", respectively, by the ambiguous information of the other sub-bands.**
>
> **Another problem when using autocorrelation functions for extracting the periodicity of a sub-band signal is that the sum autocorrelation function, which is obtained by means 306, is ambiguous. The sum autocorrelation function at output 306 is ambiguous in that an autocorrelation function peak is also generated at a plurality of a lag.** This is understandable by the fact that the sinus component with a period of t0, when subjected to an autocorrelation function processing, generates, apart from the wanted maximum at t0, also maxima at the plurality of the lags, i.e. at 2t0, 3t0, etc. " [emphasis added by Applicants]

As is made clear from Fig. 2 of **SCHEIRER**, the signal in **SCHEIRER** is divided into sub-bands. Any processing using a sub-band signal of **SCHEIRER** is auto-correlated to obtain rhythm raw-information. Then all of the rhythm raw information from **SCHEIRER**'s sub-bands are simply added together to obtain the resulting "summary auto-correlation" of Fig. 2 of **SCHEIRER**.

Thus, comparing Fig. 2 of the prior art reference to claim 1, the band pass filter of **SCHEIRER** could, for the sake of argument, be analogized to Applicants' particularly claimed

"means for dividing" of claim 1. Applicants' particularly claimed "means for examining at least one sub-band signal" would then, arguendo, be analogized to the block entitled "block correlation" in Fig. 2 of **SCHEIRER**. Further, Applicants' particularly claimed "means for establishing the rhythm information" could be analogized, arguendo, to the summary auto-correlation block of Fig. 2 of **SCHEIRER**. But, following this through, it can be seen from Fig. 2 of **SCHEIRER that there is nothing in that reference that corresponds to Applicants' particularly claimed "means for post-processing rhythm raw-information for the sub-band signal"** required by Applicants' claim 1 or "**postprocessing the rhythm raw-information for the sub-band signal**" of claim 7. Rather, as Fig. 2 of **SCHEIRER** shows, **no post-processing of the individual auto-correlation results takes place in SCHEIRER**.

Item 5 of the Office Action, states, in relevant part:

> "Regarding claims 1 and 7, Scheirer discloses the use of a means for dividing an audio input signal into at least two sub-bands (See fig. 2, second page; Note: pages unnumbered) by the use of band pass filters, means of examining the sub-bands with regard to periodicity by an autocorrelation function (fig. 2; page 3, first column, first paragraph), **and post-processing the rhythm information to 'reduce' ambiguity** (the Examiner interprets Scheirer's 'clear peak . . . .at lag 0.6 seconds' to imply a reduced ambiguity)." [emphasis added by Applicants]

Note that, it's not even alleged in the Office Action that **SCHEIRER** performs post-processing of the rhythm information **for the sub-band signal**. Such post-processing **for the sub-band signal** is clearly part of Applicants' independent claims 1 and 7, whereas **SCHEIRER**, in the portion cited in the Office Action (i.e., page 3, second complete paragraph) **clearly only relates to the summary auto-correlation** formed by combining the individual sub-band signals, as shown in Fig. 2 of **SCHEIRER**, last block. It is clear from **SCHEIRER** that no sub-band domain post-processing takes place in that reference.

As a result, the problems of the **SCHEIRER** reference are outlined in paragraph [0019] of the instant application. As quoted above, in the system taught in **SCHEIRER**:

> "If, however, the voice is dominant, which will provide no particularly clear rhythm information, the rhythm determination will be ambiguous."

Further problems of the **SCHEIRER** reference are outlined in paragraph [0020] of the instant application which, as additionally quoted above, states:

> **"Another problem when using autocorrelation functions for extracting the periodicity of a sub-band signal is that the sum autocorrelation function, which is obtained by means 306, is ambiguous. The sum autocorrelation function at output 306 is ambiguous in that an autocorrelation function peak is also generated at a plurality of a lag.** This is understandable by the fact that the sinus component with a period of t0, when subjected to an

> autocorrelation function processing, generates, apart from the wanted maximum at t0, also maxima at the plurality of the lags, i.e. at 2t0, 3t0, etc. " [emphasis added by Applicants]

In accordance with the invention of Applicants' claims 1 and 7, as outlined in paragraph [0031] of the present application:

> "**The present invention is based on the knowledge that a postprocessing of an autocorrelation function can be performed sub-band-wise, to eliminate the ambiguities of the autocorrelation function for periodical signals**, and tempo information, which an autocorrelation processing does not provide, respectively, are added to the information obtained by an autocorrelation function. **According to an aspect of the present invention, an autocorrelation function postprocessing of the sub-band signals is used to eliminate the ambiguities already "at the root", and to add "missing" rhythm information, respectively.** " [emphasis added by Applicants]

As such, as claimed by Applicants in independent claims 1 and 7, ambiguities are removed **from the sub-band signal**, i.e., at the place where there is quite a good chance to see the ambiguities. In **SCHEIRER**, however, because of the summary auto-correlation of the sub-band signals, all of the ambiguities superimpose on each other and it is very difficult to process the summary auto-correlation to reduce the ambiguities. Thus, as outlined in paragraph [0031] of the instant application, quoted above, an auto-correlation function processing of the **sub-band signals** eliminates ambiguities already **at the root of the problem**, i.e., immediately after the generation of the ambiguities. Thus, in

the invention of Applicants' independent claims 1 and 7, ambiguities are removed before they affect any summary auto-correlation, which may, for example, be used for establishing the rhythm information.

As outlined above, **SCHEIRER** does not teach or suggest Applicants' claimed **postprocessing of the raw-rhythm information for the sub-band signals**, and thus, Applicants' independent claims 1 and 7 are believed to be patentable over the **SCHEIRER** reference.

It is accordingly believed that none of the references, whether taken alone or in any combination, teach or suggest the features of independent claims 1 and 7 - 11. Claims 1 and 7 - 11 are, therefore, believed to be patentable over the art. The dependent claims are believed to be patentable as well because they all are ultimately dependent on claim 1. As it is believed that the claims were patentable over the cited art in their original form, the claims have not been amended to overcome the references.

Finally, Applicants appreciatively acknowledge the Examiner's statement that claims 2 - 6 "would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims." In light of the

above, Applicants respectfully believe that rewriting of claims 2 - 6 is unnecessary at this time.

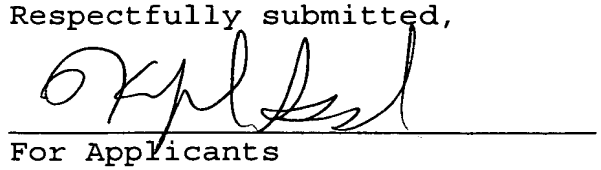
In view of the foregoing, reconsideration and allowance of claims 1 - 11 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate receiving a telephone call so that, if possible, patentable language can be worked out.

If an extension of time for this paper is required, petition for extension is herewith made.

Please charge any fees that might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,



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